



**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Application No.: 10/765,822  
Filing Date: January 27, 2004  
Applicant: Paul E. Krajewski et al.  
Group Art Unit: 1745  
Examiner: John S. Maples  
Title: EXTRUDED BIPOLAR PLATES  
Attorney Docket: GP-303999

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**APPELLANT'S APPEAL BRIEF**

This is Appellant's Appeal Brief filed in accordance with 37 CFR § 41.37 in response to the Examiner's Final Office Action mailed July 21, 2006. Appellant's Notice of Appeal, pursuant to 37 CFR § 41.31, is being filed concurrently herewith. The Appeal Brief fee pursuant to 37 CFR § 41.20(b)(2) is enclosed.

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## **Table of Authorities**

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**I. Real Party in Interest**

The real party in interest for this appeal is General Motors Corporation of Detroit, Michigan, the assignee of the application.

**II. Related Appeals and Interferences**

There are no related appeals or interferences.

**III. Status of the Claims**

Claims 1-18 and 22-24 are pending in this application. Claims 19-21 were cancelled in a Response mailed May 4, 2006 to the Examiner's First Office Action mailed November 18, 2005 as being drawn to a non-elected invention. Claims 1-18 and 22-24 were subject to a second Restriction Requirement mailed April 19, 2006. Appellant elected Group I, claims 1-18, in response thereto. Appellant filed a Petition from Requirement for Restriction on May 4, 2006 in response to the second Restriction Requirement, pursuant to 37 CFR §1.144, which was granted August 18, 2006.

A Response under 37 CFR §1.116 to the Final Office Action is being filed concurrently herewith to correct a mistake in independent claim 22.

Claims 1-18 stand finally rejected under 35 USC §102(e) as being anticipated by U.S. Patent No. 6,893,765 issued to Nishida et al. (hereinafter Nishida) and claims 1-7 and 10-17 stand finally rejected under 35 USC §102(e) as being anticipated by Goebel (hereinafter Goebel).

#### **IV. Status of Amendments**

All amendments have been entered, except the amendment under 37 CFR §1.116 being filed concurrently herewith. Claims 22-24 have not been considered.

#### **V. Summary of Claimed Subject Matter**

Independent claim 1 claims a fuel cell, such as fuel cell 70 shown in figure 10. The fuel cell 70 includes a first metal bipolar plate 72 including flow channels 74, 76 and 78, and a second metal bipolar plate 80 including flow channels 82, 84 and 86. A membrane 92 is positioned between the bipolar plates 72 and 80. The bipolar plates 72 and 80 are extruded bipolar plates formed by an extrusion process, such as shown in figure 1.

Independent claim 11 claims a metal bipolar plate for a fuel cell, such as bipolar plate 52 shown in figure 8. The bipolar plate 52 includes flow channels, such as flow channels 64 extending through the plate 52. The bipolar plate 52 is an extruded bipolar plate formed by an extrusion process, such as shown in figure 1.

Independent claim 22 claims a fuel cell, such as fuel cell 70 shown in figure 10. The fuel cell 70 includes a metal anode side bipolar plate 80 having anode flow channels 84, cathode flow channels 86, cooling fluid flow channels 82 and edge recesses 90. The fuel cell 70 also includes a metal cathode side bipolar plate 72 having cathode flow channels 78, anode flow channels 76, cooling fluid flow channels 74 and edge recesses 88. The fuel cell 70 also includes a membrane 92. The bipolar plates 72 and 80 are extruded bipolar plates formed by an extrusion process, such as shown in figure 1.

## **VI. Grounds of Rejection to be Reviewed on Appeal**

Whether claims 1-18 should be rejected under 35 USC §102(e) as being anticipated by Nishida, and whether claims 1-7 and 10-17 should be rejected under 35 USC §102(e) as being anticipated by Goebel.

## **VII. Argument**

### **A. Anticipation**

MPEP 2131 states that in order for a claim to be anticipated, the reference must teach every element of the claim.

### **B. Independent claims 1 and 11 are not anticipated by Nishida or Goebel**

#### **1. Independent claims 1, 11 and 22**

Independent claims 1, 11 and 22 state that one or more metal bipolar plates for a fuel cell are extruded bipolar plate. Independent claim 1 specifically states, “the first and second bipolar plates are extruded bipolar plates...”. Independent claim 11 specifically states, “said bipolar plate being an extruded bipolar plate...”. Independent claim 22 specifically states, “said...bipolar plate being an extruded bipolar plate...”.

#### **2. Claims 1, 11 and 22 are not product-by-process claims**

Independent claims 1 and 22 claim a fuel cell and independent claim 11 claims a metal bipolar plate for a fuel cell. A product-by-process claim is a claim for a product that is limited by and defined by a process. MPEP 2173.05(p). Independent claims 1, 11 and 22 are not defined by the process of making the fuel cell or bipolar plate, but are defined by the structural elements that make up the fuel cell or bipolar

plate. Independent claims 1, 11 and 22 specifically state that the bipolar plates are extruded bipolar plates, which defines them as a structural element and not a process.

Independent claims 1 and 11 do state that the flow channels are formed by an extrusion process. However, this is merely descriptive language that identifies how the flow channels are formed for a bipolar plate that is an extruded bipolar plate. MPEP 2173.05 (g) states that functional language in a claim does not in and of itself render a claim improper, and should be evaluated and considered just like any other limitation of the claim for what it fairly conveys to a person of ordinary skill in the art. A functional limitation is often used in association with an element to define a particular capability or purpose that is served by the recited element.

The Examiner has cited In Re Thorpe 227 USPQ 964 as holding that the determination of the patentability of a product-by-process claim is based on the product itself, and not the process by which the product is made. The MPEP section identified above supports this contention. However, the In Re Thorpe decision specifically addressed a claim for a product made by a process, i.e., a product-by-process claim. Appellant's independent claims 1 and 11 are not product-by-process claims, but are product claims, and are not governed by In Re Thorpe.

Even assuming that independent claims 1 and 11 are product-by-process claims, Appellant submits that the language that the bipolar plates are made by an extrusion process adds patentability significance to the claims. MPEP 2113 states, "[t]he structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product." Appellant submits that stating that the

bipolar plates are made by an extrusion process does impart a distinctive structural characteristic to the plate because an extruded bipolar plate will have a distinctive profile and structural desirability's over bipolar plates made by other processes, such as stamping processes.

### 3. Discussion of Nishida

Paragraph 8 of the Appellant's specification discusses limitations of bipolar plates for fuel cells made by a metal stamping process. Appellant overcomes these limitations by using an extruded bipolar plate.

Nishida discloses a polymer electrolyte fuel cell that includes anode-side separator plates 21 and cathode-side separator plates 31. As discussed in column 5, lines 11-23 and lines 46-50, the separator plates 21 and 31 are fabricated by a pressing and stamping process. The plates 21 and 31 shown in figure 1 of Nishida have a clear stamped plate profile. Particularly, an extruded bipolar plate will have a different profile than a stamped bipolar plate. Examples of extruded bipolar plate profiles can be seen in Appellant's figures 2-9. It is the bipolar plates for fuel cells that are made by pressing and stamping manufacturing processes that Appellant is attempting to improve upon. The Examiner has not identified a teaching in Nishida of an extruded bipolar plate for a fuel cell. Appellant submits that nowhere in Nishida does it teach a metal bipolar plate for a fuel cell fabricated by an extrusion process, and thus, nowhere in Nishida does it teach an extruded metal bipolar plate for a fuel cell. Therefore, Appellant respectfully submits that Nishida cannot anticipate independent claims 1 and 11, or anticipate or make obvious independent claim 22, because Nishida does not teach extruded metal bipolar plates.



4. Discussion of Goebel

Goebel discloses MEAs 8 and 10 for a PEM fuel cell stack including bipolar plates 12, 14 and 16. The bipolar plates 12, 14 and 16 include various flow channels, such as flow channels, 66, 68 and 70. The Goebel bipolar plates 12, 14 and 16 are not extruded metal bipolar plates as claimed by Appellant. Contrary, the bipolar plates disclosed by Goebel are stamped bipolar plates as is clear by the stamped plate profiles shown in figures 3-5. The Examiner has not identified a teaching in Goebel of an extruded bipolar plate for a fuel cell. Appellant submits that nowhere in Goebel does it teach a metal bipolar plate for a fuel cell fabricated by an extrusion process, and thus, nowhere in Goebel does it teach an extruded metal bipolar plate for a fuel cell. Therefore, Appellant submits that Goebel does not anticipate independent claims 1 and 11, or anticipate or make obvious independent claim 22, because Goebel does not teach extruded metal bipolar plates.

**C. Dependant claims 7, 8 and 17 are not anticipated by Nishida or Goebel**

Independent claim 22 and dependant claims 7 and 17 state that the bipolar plates include recessed edges, and dependant claim 8 states that the fuel cell includes end plates positioned in the recessed edges for securing the first and second bipolar plates together.

The Examiner states that the bipolar plates taught by Nishida are recessed at the right hand and left hand sides of the plates as shown in figure 1. Appellant submits that the Examiner is mistaken and that there are not recesses in the edges of the separator plates 21 and 31. Therefore, Appellant submits that Nishida cannot anticipate independent claim 22 and dependent claims 7 and 17.

The Examiner states that the bipolar plates taught by Goebel are recessed at the right hand and left hand sides of the plates as shown in figures 2-5. Appellant submits that the Examiner is mistaken and that there are not recesses in the edges of the bipolar plates 12, 14 and 16. Therefore, Appellant submits that Goebel cannot anticipate independent claim 22 and dependent claims 7, 8 and 17.

### VIII. Conclusion

Appellant respectfully submits that for the reasons discussed above, claims 1-18 are not anticipated by Nishida and claims 1-7 and 10-17 are not anticipated by Goebel. For the same reasons, independent claim 22 is also not anticipated or made obvious by Nishida and Goebel. It is therefore respectfully requested that the Examiner's final rejections under 35 USC §102(e) be reversed and that Appellant's claims be allowed.

Respectfully submitted,

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CLAIMS APPENDIX

**COPY OF CLAIMS INVOLVED IN THE APPEAL**

1. A fuel cell comprising:
  - a first metal bipolar plate including flow channels;
  - a second metal bipolar plate including flow channels; and
  - a membrane formed between the first and second bipolar plates, wherein the first and second bipolar plates are extruded bipolar plates where the flow channels are formed by an extrusion process.
2. The fuel cell according to claim 1 wherein the flow channels in the first and second bipolar plates are selected from the group consisting of square, rectangular, trapezoidal, round, sinusoidal and elliptical shaped flow channels.
3. The fuel cell according to claim 1 wherein the flow channels include flow channels for a cooling fluid.
4. The fuel cell according to claim 3 wherein the flow channels extend through a middle portion of the first and second bipolar plates.
5. The fuel cell according to claim 1 wherein the flow channels include anode flow channels and cathode flow channels.
6. The fuel cell according to claim 5 wherein the anode and cathode flow channels are provided at outside edges of the first and second bipolar plates.

7. The fuel cell according to claim 1 wherein the first and second bipolar plates include recessed edges.

8. The fuel cell according to claim 7 further comprising end plates positioned in the recessed edges for securing the first and second bipolar plates together.

9. The fuel cell according to claim 1 wherein the first and second bipolar plates are extruded aluminum plates.

10. The fuel cell according to claim 1 wherein the fuel cell is for an automotive application.

11. A metal bipolar plate for a fuel cell, said metal bipolar plate comprising a series of flow channels extending through the plate, said bipolar plate being an extruded bipolar plate where the flow channels are formed by an extrusion process.

12. The bipolar plate according to claim 11 wherein the flow channels are selected from the group consisting of square, rectangular, trapezoidal, round, sinusoidal and elliptical shaped flow channels.

13. The bipolar plate according to claim 11 wherein the flow channels include flow channels for a cooling fluid.

14. The bipolar plate according to claim 11 wherein the flow channels include anode flow channels and cathode flow channels.

15. The bipolar plate according to claim 11 wherein the flow channels extend through a middle portion of the plate.

16. The bipolar plate according to claim 11 wherein the flow channels are provided at outside edges of the plate.

17. The bipolar plate according to claim 11 further comprising recessed edges.

18. The bipolar plate according to claim 11 wherein the plate is an extruded aluminum plate.

22. A fuel cell comprising:

an anode side metal bipolar plate, said anode side metal bipolar plate being an extruded bipolar plate, said anode side bipolar plate including anode side flow channels at one side of the anode side metal bipolar plate for the fuel cell, cathode side flow channels at an opposite side of the anode side metal bipolar plate for an adjacent fuel cell and cooling fluid flow channels extending through a middle portion of the anode side bipolar plate, said anode side metal bipolar plate further including a recess at each end of the anode side metal bipolar plate;

a cathode side metal bipolar plate, said cathode side metal bipolar plate being an extruded bipolar plate, said cathode side bipolar plate including cathode side flow channels at one side of the cathode side metal bipolar plate for the fuel cell, anode side flow channels at an opposite side of the cathode side bipolar plate for an adjacent fuel cell and cooling fluid flow channels extruding through a middle portion of the

cathode side bipolar plate, said cathode side metal bipolar plate further including a recess at each end of the cathode side metal bipolar plate; and

a membrane positioned between the anode side bipolar plate and the cathode side bipolar plate.

23. The fuel cell according to claim 22 wherein the cooling fluid flow channels in the anode side and cathode side bipolar plates are selected from the group consisting of square, rectangular, trapezoidal, round, sinusoidal and elliptical shaped flow channels.

24. The fuel cell according to claim 22 further comprising end plates positioned in the recesses at the ends of the anode side and cathode side bipolar plates for securing the anode side and cathode side bipolar plates together.

EVIDENCE APPENDIX

There is no evidence pursuant to §1.130, §1.131 or §1.132.

RELATED PROCEEDINGS APPENDIX

There are no decisions rendered by a court or the Board in any proceeding identified in Section II of this Appeal Brief.